Remarks

Claims 1-20 remain in the application.

The Examiner has rejected Claim 2 under 35 .U.S.C. §112,¶2 for indefiniteness and lack of proper antecedent basis. Claim 2 has been amended to remove these non-substantive problems as well as minor editorial problems.

The punctuation in Claims 3 and 4 has been changed to clarify the dependence of the steps and substeps. Dependent Claims 3 and 9 have been amended to require that the wavelength conversion occur in the optical domain. Many of the claims have been generalized from fiber Bragg grating to an optical filter including a Bragg grating.

The Examiner has rejected Claims 1-11 and 13 under 35 U.S.C. §103(a) as being obvious over Chang (U.S. Patent 6,525,850) in view of Mizrahi (U.S. Patent 6,067,181). This rejection is traversed.

The bulk of the Chang reference is not particularly relevant to the present invention. FIGS. 3, 7, 8, 9, 10 and 13 involve the detection of the optical payload and thus necessarily the electrical-to-optical conversion to put the payload back into optical form. Whatever subcarrier multiplexing is present is being performed in the electrical domain before the combined electrical signal is converted into optical form. FIG. 12 and to a lesser extent FIG. 14 are somewhat more relevant, but they all involve a non-spectral splitting of the header/payload, and the remodulation of the combination of the old header and payload optical signal to form an optical signal with a new header added at a new subcarrier frequency.

Chang's FIG. 15 as described at col. 24, ll. 34-53, is more relevant than the other figures of Chang. In this embodiment, Chang divides the optical input into two paths. On the header path, the combined signal is detected and then filtered to produce an electrical header signal. On the payload path, a notch filter removes the signal at the header subcarrier frequency and absorbs it. The notch filter includes an optical circulator 1510, Fabry-Perot filter 1515, and attenuator 1520. The optical payload signal stripped of the old header is then remodulated with the new

header at the original subcarrier freqency f_N. Although the cited passage is silent on the form of the remodulation, Chang describes at col. 24, lines 1-25 the use of a $LiNbO_3$ optical modulator operating on the optical payload signal in addition to the original optical header.

Even though the Examiner never references FIG. 15, the combination of Chang's FIG. 15 and Mizrahi will be discussed. The combination as applied to the present claims is asserted to be non-obvious. Mizrahi in FIG. 1 as described at col 3, ll. 7-uses an optical circulator 31 and filtering element 40 in a feedback loop for locking the output wavelength of a transmitter laser 20. The transmission coefficient of filtering element 40 graphed in FIG. 2 shows low transmission (i.e. high reflection) at a center wavelength λ_0 and high transmission away from the center wavelength. What signal is transmitted through the filtering element 40 is detected as an error signal and is used to drive the laser back to the bandwidth 81 about the center wavelength λ_0.

First, the Chang and Mizrahi references are not within the same areas of technology meriting consideration as combinable prior art in the way done by the Examiner. The relevant portions of Chang are concerned with separating closely spaced header and payload signals in a WDM communication network. Even though Mizrahi operates within a WDM communication network, Mizrahi is concerned only with locking the wavelength of the laser. Mizrahi is not concerned with separating WDM signals, only assuring that they stay locked at the proper frequency. Mizrahi's invention is relevant to and combinable with the transmitters of Chang, not to Chang's receivers which are cited by the Examiner.

Secondly, the filtering circuits of Chang and Mizrahi are significantly different. Chang uses a Fabry-Perot filter that provides a narrow central transmission bandwidth but which additionally has significant sub-lobes describable by the Airy function. These side lobes likely overlap the payload at the carrier frequency. For Chang's absorber, the extra payload signal is simply discarded. To use Chang's Fabry-Perot to pass a header subcarrier to a detector would also pass, although with reduced transmission efficiency, the much large payload signal. That is, Chang's Fabry-Perot may adequately separate subcarrier header from the reflected payload signal but does not adequately separate the payload signal from the transmitted header signal..

Mizrahi uses a Bragg grating that reflects within a narrow bandwidth 81 and otherwise provides uniform reflectance. Substituting Mizrahi's filter for Chang's filter produces a non-operable filter circuit for separating Chang's relatively narrow SCM signal from his wider payload signal.

Thirdly, it is unreasonable to assert that an ordinary mechanic would view Chang disclosure and consider that the only loosely related art of Mizrahi could teach using Chang's elements in a better way. Chang discloses both an optical filter centered at a wavelength to pass a subcarrier frequency and an optical detection circuit connected to a different part of the system subcarrier. Who knows better than Chang how to use those optical filters and sucarrier detectors. Chang very well knows about optical detection. But, Chang teaches against placing an optical detector downstream from his optical circulator but instead believes that a separate circuit is required for the sub-carrier filtering and detection.

Fourthly, Chang teaches the subcarrier is detected by first detecting the combined header and payload optical signals and then electrically filter the header while the Examiner is asserting that it is obvious to others to instead optical filter first and detect secondly. No suggestion appears in the art for reversing the order of Chang's functions.

Fifthly, it is not clear that the optical circulator filters of Chang or Mizhrari even have the required characteristics. The filter characteristics in the structure of the claim requires that very little of the payload be filtered and detected with the subcarrier header. In contrast, Chang's circulator filter followed by an absorber allows a small portion of the payload signal to pass through the filter to the absorber and be absorbed there. As discussed above, Chang's Fabry-Perot filter has relatively strong side lobes which likely encroach into the payload, which is unacceptable in detecting the lower-power subcarrier in the presence of the higher power payload. Similarly, Mizhrari's Bragg filter need not be particularly sharp. It only needs to have a maximum at or near the center frequency. Indeed, Mizrahi's feedback control become difficult if the filtering characteristic is too narrow. Bidirectional feedback control requires a finite region of sloping response away from the maximum. A sharply peaked, on-and-off characteristic, which is useful for separating two wavelength signals, in the context of feedback control makes it difficult to proportionately control the correction or even know in which direction correction is

required. As a result, substituting Mizrahi's Bragg grating and detector for Chang's fiber Bragg grating and absorber is not likely to produce a useful device.

The Examiner uses unpermitted hindsight in stating that "[o]ne skilled in the art would have been motivated to use the circulator/Bragg grating device of Mizrahi in the system of Chang in order to more efficiently separate the data payload from the subcarrier signal of the header' and to eliminate several elements of Chang. The present inventor appreciated the increased efficiency and reduced complexity of the claimed invention over the complex electronics of Chang. Lacking additional prior art references, the suggestion of these advantages is not apparent in the prior art and the rejection must be removed.

Turning specifically to the claims, Claim 1 requires putting the subcarrier multiplexed baseband optical signal through an optical circulator and optically separating the subcarrier in the Bragg grating and directing it to the optical energy transducer. In contrast, Chang absorbs the subcarrier exiting the circulator. As argued above, Mizrhari's optical detection is not obviously combinable with Chang to read on the claim. Claim 2 expands on the subcarrier detection. Claim 3 is allowable for the same reasons as Claim 1.

Claim 4 is allowable for the same reasons as Claim 1. Additionally, Claim 4 requires changing the wavelength of the optical signal. Additionally, Claim 4 requires changing the wavelength of the optical carrier of the payload. Chang's optical switch & ADM 15 of FIG. 15 does not perform this conversion since the input and output subscarriers are shown at the same frequency f_N. This distinction has been strengthened by requiring that the wavelength conversion be performed in a process not including converting the payload to electronic form, as supported in ¶18 of the published application. The other parts of Chang's disclosure include instances of wavelength conversion, but all appear to include optical-to-electronic conversion.

Claim 5 additionally requires that the new header be written into the optical signal after the optical signal has been redirected to the desired output port. While Chang in FIG. 12 may write a new header in the optical switch & ADM 1207, Chang does not state that it is written before or after the switching. Since this writing is to a different subcarrier frequency, it can easily be performed prior to switching. In Chang's FIG. 15, since there is no active subcarrier

header entering the optical switch & ADM 1207, the new subcarrier header could easilly be added prior to switching.

Claim 6 is allowable for the same reasons presented for Claim 1. Claim 7 expands on the optical detection.

Claim 8 is allowable for the same reasons as Claim 1.

Claim 9 depends from Claim 7 and should therefore also be allowable. Additionally, Claim 9 requires changing the wavelength according to control information. This language has been further tightened, as presented above for Claim 4.

Claims 3, 5, 8, and 13 require modulation of an existing optical signal with header or control information. These claims are additionally allowable. With respect to Claim 5, the Examiner references Chang at col. 21, ll. 51-62. The Examiner is over interpreting this passage. Figure 12 is a more detailed version of FIG. 10 (col. 19, ll. 49-51), which in turn is a more detailed version of FIG. 4 (col. 18, ll. 42-44). The description of Chang's optical switch & ADM 1207 fails to state that the electronic IF header modulates the preexisting data signal on 1208. In fact, if this were done, much interference would be created since the signal on 1208 contains both the data payload and the frequency offset headers. Both payload and all headers would be modulated to create a multitude of signals, some of which could overlap and interfere with the original signals. In any case, the operation of FIG. 12 seems to assume adding a new subcarrier header wavelength at each node. New dependent claims have been added requiring the rewritten header to be at the original frequency.

Claim 9 is additionally allowable. This claim has been amended to remove an obvious redundancy. The claim requires that the optical carrier wavelength be dictated by the control information extracted by the optical subcarrier receiver. It is not seen how the wavelength conversion of Claim 9 can be combined with Chang's FIG. 15, which does not include a separate optical source and anticipates that the transmission wavelength be maintained. The Examiner cites Chang at col. 17, ll. 3-15 for this feature. Although Chang's wavelength conversion shares some elements, he describes a different type of routing in which either the wavelength channel continues along the same route or is redirected to a different output port according data contained

in a routing table at the node. Only if the desired wavelength channel on the selected output port is the wavelength converted. That is, the new wavelength is not dictated by Chang's header determining the routing but is dictated by the congestion at the selected output port. Chang's header selects the output port; it does not select the wavelength used at that output port.

Chang fails to even disclose a tunable optical source. Chang is relying upon electronic switching. The wavelength selection of Chang occurs when the switched channels are reconverted to optical form. For this purpose, it is typical to use an array of lasers each emitting at one of the WDM wavelengths. A tunable optical source is not inherent in the wavelength conversion of Chang. Claim 10 further expands on the nature of the tunable optical source. Again the Examiner appeals to the existence of such tunable lasers in the prior art. However, he fails to find a teaching in the prior art for applying such tunable lasers to Chang's electronic switch.

The Examiner has rejected Claim 12 under 35 U.S.C. §103(a) as being obvious over Chang in view of Mizrahi and Gehler (U.S. Patent 6,400,872). This claim depends from a claim believed to be in allowable form and should therefore also be allowable. Further, although Gehler very briefly discloses that a arrayed waveguide grating (AWG) can be used as an optical switch, he fails to teach that the AWG can be used in combination with a tunable laser to perform the switching according to the laser wavelength tuning.

A new set of Claims 19 and 20 and new dependent Claims 14-17 emphasize that the control information on the subcarrier is detected as a low-frequency electrical or modulation component of the optical signal passed by the optical filter. Such low frequency detection avoids Chang's complex mixing in multipliers 1221 and band-pass filters 1221 and is effective because the low-frequency payload modulation has been removed in the Bragg filter system. The claimed low-frequency component corresponds to the frequency of the control information modulation which is well below the subcarrier modulation frequency, typically in the 10GHz range. The applied art is silent on the effectiveness of low-pass filtering or other such techniques for detecting the control information modulation.

In view of the above amendments and remarks, reconsideration and allowance of all

claims are respectfully requested. If the Examiner believes that a telephone interview would be helpful, he is invited to contact the contact attorney at the listed telephone number, which is on California time.

Respectfully submitted,

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